HITACHI®

LIQUID CRYSTAL DISPLAY MODULES AND DEVICES

The Clear Advantage In LCD Technology

Unsurpassed Technology, Resources, and Commitment Make Hitachi Your Best LCD Partner

Selecting the right display for your product is one of the most important decisions you can make. Customers always focus their first attention on the display, making it the most thoroughly examined single element in your product.

Because a good first impression is critical to your product's success, you need a display supplier/partner who has an in-depth commitment to LCD technology.

That's Hitachi.

Leadership in technology

Hitachi has been a pioneer in LCD research and development ever since the infancy of commercial LCD technology. Starting in 1968, Hitachi began basic research on the electro-optical properties of liquid crystal materials. By 1972, Hitachi production of LCDs was well underway.

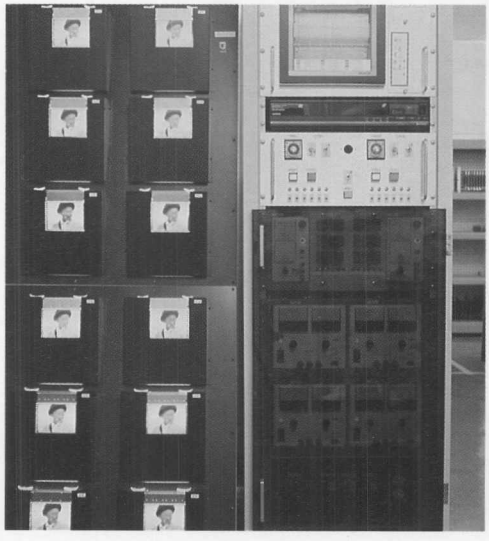
Hitachi expertise has led to a number of important firsts in the LCD industry:

- The first production TN-FE mode numerical LCDs for wristwatch applications.
- The first LSIs for driving matrix LCDs.
- The first LCDs for television applications.
- The first production Super Twist LCD.
- The first LCDs for use in an automotive instrument panel.
- The first production of large-size, full color active matrix LCD.

Hitachi's Mobara Works production facility uses the most advanced start-to-finish systems to produce a variety of LCD products that set quality and performance standards the world over.
Pictured here:

1. TFT/LCD Reliability Testing
2. LCD Clean Room Manufacturing Facility
3. LC Fluid Injection Equipment
4. LCD Final Electrical and Visual Inspection
5. TFT/LCD showing Tape Automated Bonding (TAB) Technology

1



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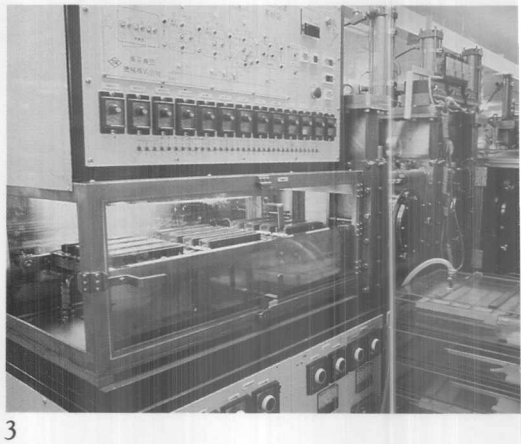


3

Leadership in manufacturing

The manufacture of LCDs—especially large graphic displays—places incredible demands on production facilities. Quality, reliability, and performance suffer unless all processes are state-of-the-art.

As one of the world's largest producers of LCDs, Hitachi has made the investment necessary to manufacture all types of quality LCDs in large production volumes. In fact, Hitachi is the most vertically integrated LCD manufacturer in the world. We process our own glass, polarizers, test fixtures, and production equipment. We make our own backlights, and are the world's largest manufacturer of LCD drivers and controllers.

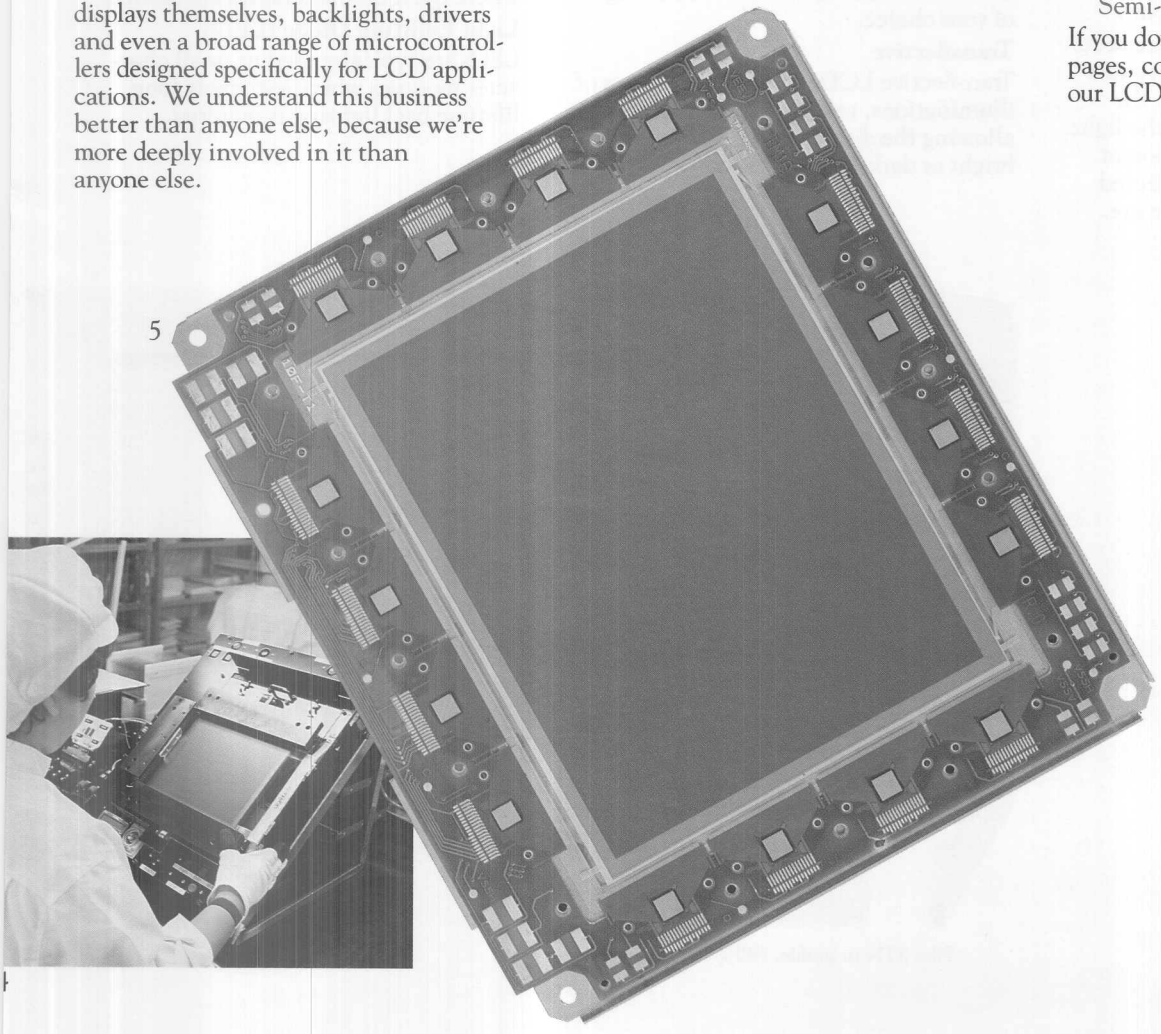
Hitachi is in the forefront of advanced process control technology, which enables us to streamline LCD manufacturing processes, while maintaining the production of high-quality, reliable, cost-effective products.

You can count on Hitachi to deliver a *complete* LCD solution—including the displays themselves, backlights, drivers and even a broad range of microcontrollers designed specifically for LCD applications. We understand this business better than anyone else, because we're more deeply involved in it than anyone else.

Leadership in product development

Hitachi's technology, resources, and commitment have allowed us to create a broad range of LCD products . . . from the monochrome displays shown in this brochure, to full-color LCD graphic displays.

We're the best LCD partner you could have.



. . . About This Brochure

This brochure will introduce you to Hitachi monochrome LCD products and their key specifications.

Product specifications are presented for two types of displays:

LCD Modules—These consist of the liquid crystal display plus built-in driver circuitry. Some also include built-in controllers.

LCD Devices—These consist of the liquid crystal display itself.

Hitachi also offers many options for our LCD products, including a choice of backlights, packaging, and transmission types.

If you don't see what you need in these pages, contact Hitachi. The breadth of our LCD product line is unmatched.

Operating Principles of LCDs: How They Work

Liquid crystal displays (LCDs) are available in transmissive, transflective and reflective types. With a reflective type, LCDs are light-reflective devices on which messages become visible by means of selectively-reflected or absorbed external light. The liquid crystal material itself has an orderly molecular arrangement, like a crystal, but also possesses some of the physical properties of liquids.

In an LCD, liquid crystal material is sandwiched between a grid of electrodes, sheets of glass, and polarizers. When no voltage, via electrodes, is applied across the liquid crystal material, the natural arrangement of the liquid crystal molecules is in a helical, or "twisted" pattern, which rotates the polarized, reflected light in the same direction as the polarizer, so the light passes through, and is visible. This visible, reflected light forms the background for the display.

When voltage is applied to the intersects in the electrode grid, the liquid crystals in these areas align themselves in the direction of the electric field, so the light is no longer rotated in the direction of the polarizers, and no light is reflected back through the sandwich to the eye. These dark fields form the message display against a background of reflected visible light.

By manipulating the crystals, different twist angles can be formed, from 90 to 260 degrees, creating various changes in display contrast and viewing angles. Because liquid crystals generate no light of their own, they must be either read in ambient light or must be backlit.

Light Transmission Options

Reflective

Reflective type LCDs use available light, as described above, to illuminate the display. A reflecting mirror and polarizers are built into the display sandwich.

Transmissive

Transmissive LCD modules use a Hot Cathode Fluorescent Light (HCFL), a Cold Cathode Fluorescent Light (CCFL), an Electroluminescent Light (EL), or Light-Emitting Diode (LED) to illuminate the display. Some displays are available with backlights already built in, while others can be fitted with backlights of your choice.

Transflective

Transflective LCDs combine two types of illuminations, reflective or transmissive, allowing the display to be used in either bright or dark environments.

Backlight Options

Backlight provides illumination that allows operation of the display in either very low or very high ambient light. There are several different types of backlights, appropriate for different applications.

Hot Cathode Fluorescent (HCFL)

HCFLs, due to their high light output and wide color spectrum, have been used exclusively in thin film transistor active-matrix displays.

Cold Cathode Fluorescent (CCFL)

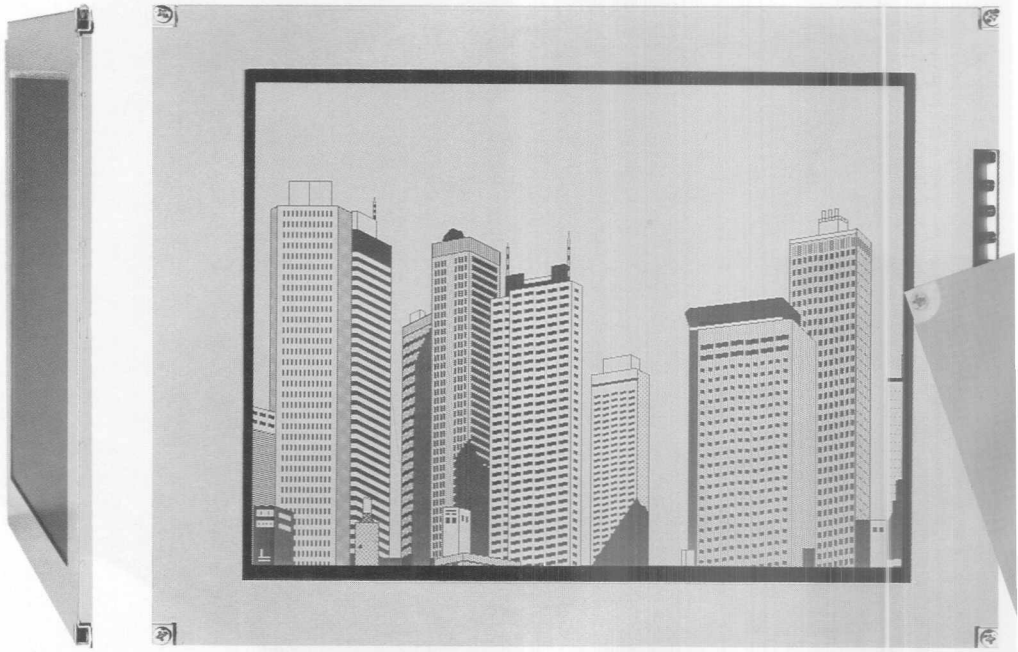
CCFL backlight provides bright backlighting for LCD legibility in high ambient light. This ability requires higher power consumption, more weight, and more thickness than other backlights.

Electroluminescent (EL)

EL backlight features low power consumption, low weight, and very thin packaging. It's an excellent choice for portable or battery-driven applications where these characteristics are desired.

Light Emitting Diode (LED)

LEDs are typically used in small character modules where extremely long lifetime backlighting is required.



Film STN in profile, 640 x 480 resolution

LCDs Provide a Number of Key Benefits for Your Design

The number of applications using LCDs has exploded in recent years. That's because LCDs have a unique combination of features and benefits unmatched by other display technologies.

Low power requirements

Unlike CRT and gas plasma displays, LCDs are inherently low power devices. Typically, they exhibit power consumption of less than 10uw/cm^2, and operate with power supply voltages of 8VDC or less.

As a result, LCDs are ideal for portable or battery-powered applications where power consumption must be as low as possible. For those applications powered from the AC line, a liquid crystal display can mean a smaller, less expensive power supply.

High readability

Clearly, one of the most important qualities of any display is that it be easy to read. In this regard, LCDs excel.

Their flickerless display means improved readability with less eye strain and fatigue. And, because of their optically passive nature, bright ambient light makes them even easier to read.

Compact packaging

LCDs are thin, compact and lightweight. While obviously popular for portable applications, these qualities can help make possible the new generation of "small footprint" electronics.

Easy integration into your design

Because of their simple interfacing and power supply requirements, LCDs get your design to market faster, with less design cost.

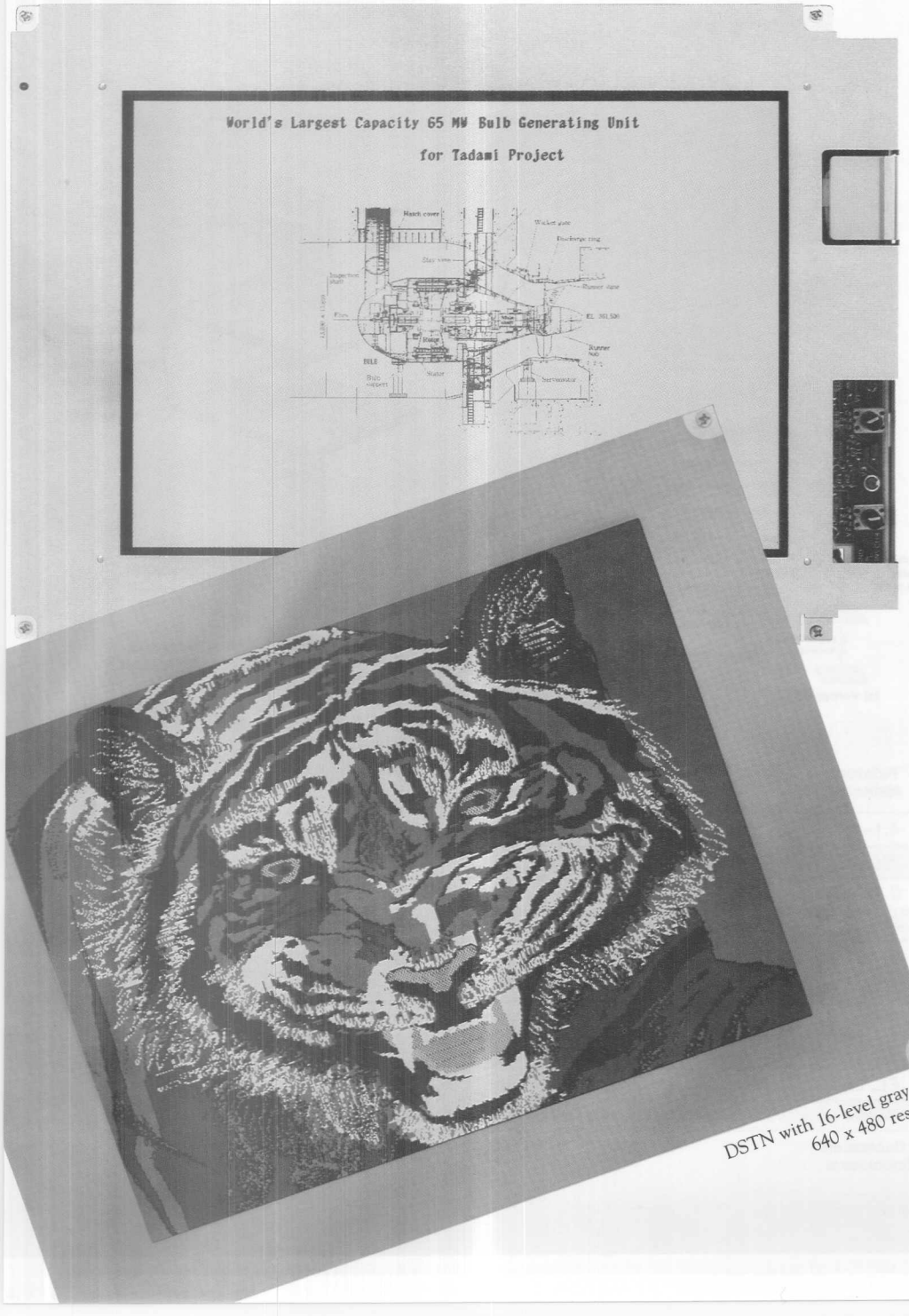
Highly rugged construction

LCDs don't rely on fragile glass envelopes or complicated structures, as do other display technologies. This gives them better durability, making your design more reliable.

Cost-effective design

Hitachi's LCDs are cost-effective design solutions, because Hitachi's highly automated manufacturing process results in lower prices per unit. Standard interfaces and low power requirements also contribute to more cost-effective designs, and help reduce your overall system costs.

DSTN 1120 x 780 resolution



DSTN with 16-level gray scale, 640 x 480 resolution

Hitachi Delivers the Right LCD Solution for Every Application

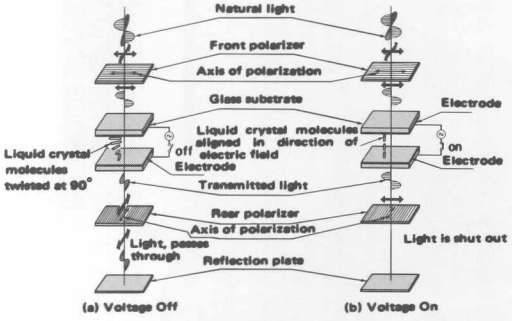
Being the leader in LCD technology, Hitachi offers all types of liquid crystal displays. We recognize that each application has different requirements and constraints. For maximum cost effectiveness, choose one of our Twisted Nematic (TN) displays. For the ultimate in flat panel performance, our Thin Film Transistor (TFT) LCDs are the display of choice. Naturally, we offer many additional technologies so you can make the best possible selection for your application.

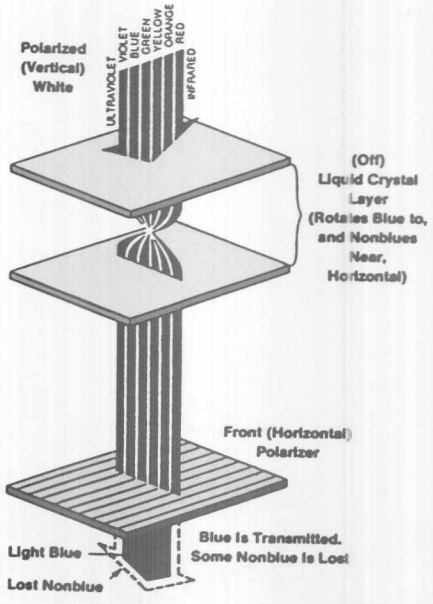
Twisted Nematic (TN)

TN was the first successful LCD technology to be used on a far-reaching basis. Its combination of low power consumption, low voltage requirements, good visibility under bright ambient light, and its compact size and low weight gave it many advances over previous display technologies. Even today, the TN LCD continues to enjoy widespread use in cost-constrained consumer and commercial applications.

Super Twisted Nematic (STN)

STN represents a refinement of basic TN technology. A single layer of glass is used, but the twist angle of the LC molecules is greater, allowing improved contrast and viewing angle. STN LCDs can often be recognized by their characteristic yellow or blue coloration.





Monochrome LCD Module Technologies Compared

	Twisted Nematic (TN)	Super Twisted Nematic (STN)
Contrast Ratio	4:1–8:1	6:1–10:1
Response Speed	200 ms	250 ms
Power Consumption (w/backlight)	0.1–3W	0.3–7W
Viewing Angle	35°	40°
Thickness (w/backlight)	5–12 mm	7–28 mm
Weight	25–150 g	150–1800 g
Resolution (max.)	240 x 64	640 x 400
Cost	.5X	.7X
Backlight	EL, LED	EL, CCFL
Color Mode	Yellow	Yellow, Blue

EL—electroluminescent
LED—light emitting diode
CCFL—cold cathode fluorescent
HCFL—hot cathode fluorescent

(Specifications are subject to change without notice.)

Double Super Twisted Nematic (DSTN)

With their move into high-end applications such as laptop computers, LCDs continue to remain the preferred display technology. DSTN adds an extra compensating liquid crystal glass substrate to provide an almost pure black-and-white display with little color tinge. It has twice the contrast of STN, and improved viewing angle.

DSTN typically requires fluorescent backlighting to compensate for the transmission losses associated with the additional layer. This option adds weight, thickness, power consumption and cost to the module itself, but delivers high brightness and high contrast.

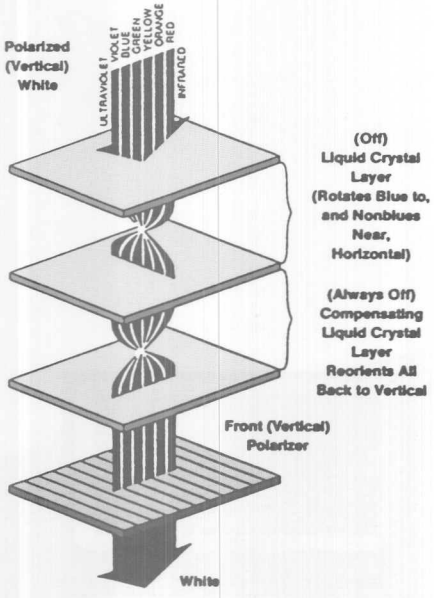
Super Twisted Nematic with Film (Film STN)

Film STN offers excellent black-and-white image quality without the trade-offs associated with DSTN. This LCD technology replaces the extra glass layer of DSTN with an ultra-thin polymer compensating film. The result is improved light transmission which allows the use of a less powerful backlight. Compared with the DSTN, the new Film STN weighs 50% less, reduces thickness by 75%, consumes 60% less power, and features a viewing angle which is 25% wider.

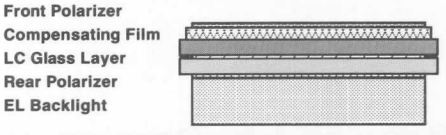
Thin Film Transistor (TFT)

The TFT LCD is Hitachi's premier flat panel display technology. TFT gives the best overall image quality, the best contrast ratio, and the widest viewing angle. In addition, TFT's fast 40 ms response speed even makes it suitable for real-time video display applications. It truly is a "no compromise" display technology.

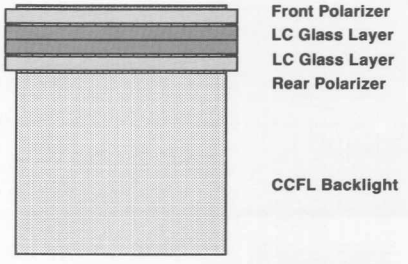
Hitachi TFT LCDs are active matrix units in which each pixel is driven by its own individual transistor driver. These driver circuits are fabricated directly onto the glass substrate itself, greatly simplifying interfacing and driving characteristics. Extremely high resolution is possible, since Hitachi's advanced manufacturing process results in a very small TFT cell.

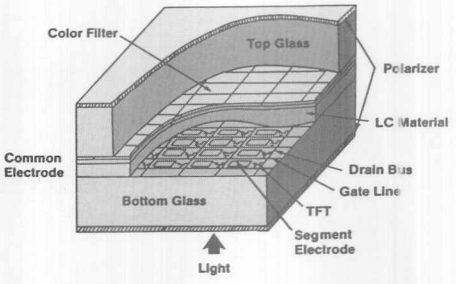


STN with Compensating Film



Double Super-Twisted Nematic





Double Super Twisted Nematic (DSTN)	Super Twisted Nematic with Film (Film STN)	Thin Film Transistor (TFT)
18:1	12:1	40:1
250 ms	250 ms	40 ms
7W	3W	6W
45°	60°	>60°
28 mm	7 mm	30 mm
1600 g	800 g	1090 g
1120 x 780	640 x 480	640 x 600
1X	1X	2.5X
CCFL	EL	HCFL
B/W	B/W	B/W

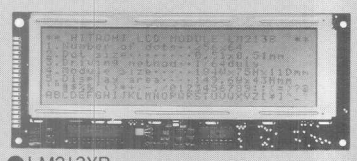
Graphic LCD Modules

Hitachi graphic LCD modules provide clear, detailed displays of graphics, symbols, and all types of alphanumerics. They have resolutions ranging from 240 x 64 to 1120 x 780, giving you the right display for virtually any application. All have built-in drivers, and some models even include built-in controllers. Hitachi also has available graphic LCD modules with electroluminescent (EL) panel backlight, or cold cathode fluorescent (CCFL) lamp backlight. See page 18 for a discussion on various packaging, backlighting and transmission options, which let you custom-configure LCD modules to match the requirements of your application precisely.

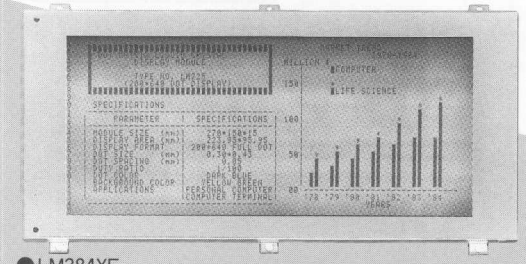
All Hitachi graphic LCD modules feature outstanding image quality and unbeatable Hitachi reliability.

Applications

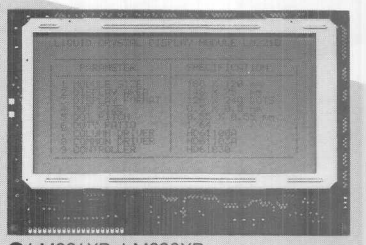
- Portable Data Terminals
- Laptop Computers
- Word Processors
- Instrument Displays
- CAD/CAM Systems
- Communications Equipment
- Overhead Projection Systems



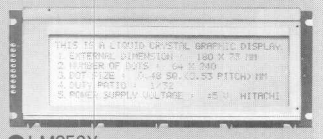
● LM213XB



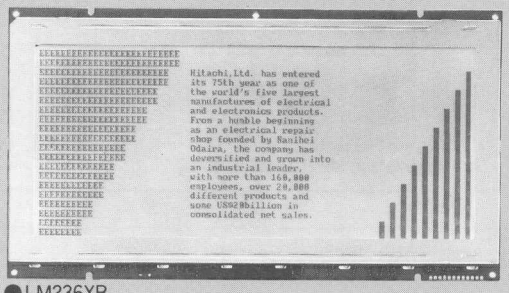
● LM384XF



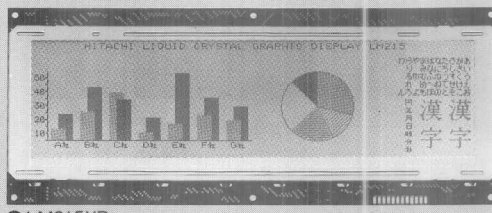
● LM221XB, LM238XB



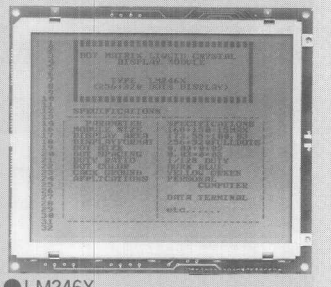
● LM258X



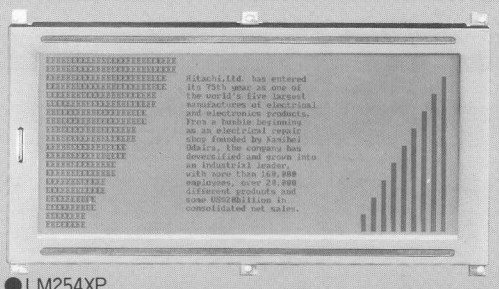
● LM236XB



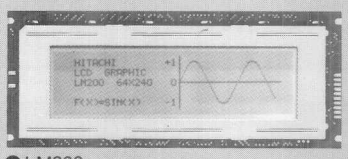
● LM215XB



● LM246X

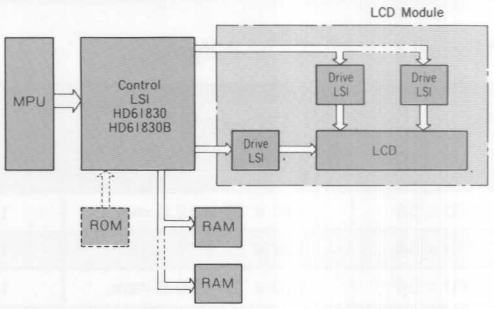
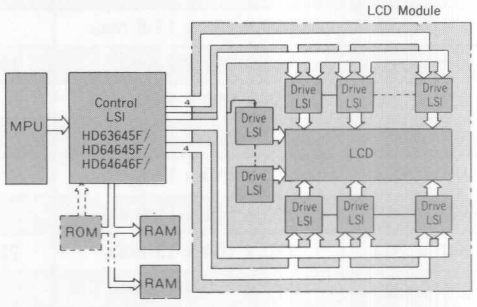
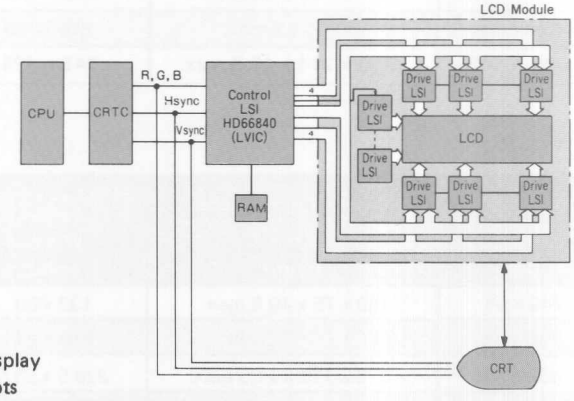


● LM254XP



● LM200

Graphic LCD Module Systems

Suggested Controller	Application	System Configuration
HD61830 HD61830B	Graphic display Dedicated LCD controller	Maximum display Characters: 80 characters x 16 lines Graphics: 480 x 128 dots 
HD63645F HD64645F HD64646F (LCTC)	Controller for providing CRTC display and software-compatible LCD display	Maximum display 640 x 400 dots 
HD66840 (LVIC)	Controller for converting standard video signal for CRT display to LCD display data	Maximum display 720 x 540 dots 

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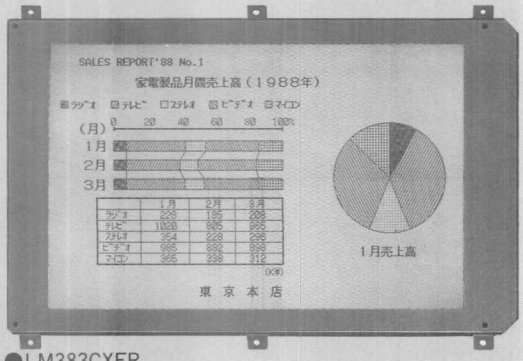
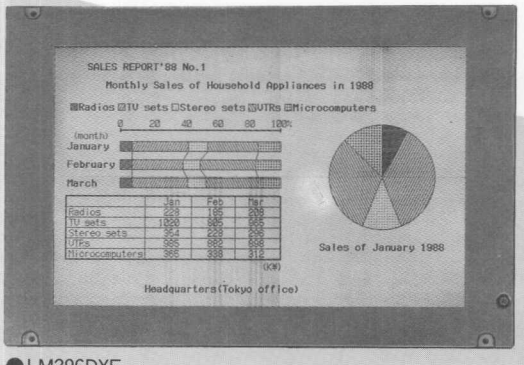
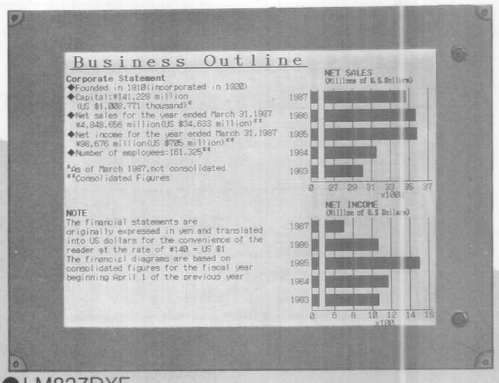


●LM383CXFR



●LM296DXF



●LM837DXF

Graphic LCD Modules

Graphic LCD Modules (without backlight)

Part No.	No. of dot W x H (dot)	External dimensions W x H x T (mm)	Effective viewing area W x H (mm)	Dot size W x H (mm)	Driving method (Duty)	Recommended power supply VDD-VSS (V)	Recommended power supply VEE-VSS (V)	Power consumption (typ.) (mW)
LM200†	240 x 64	180 x 75 x 13.8 max.	132 x 39	0.48 x 0.48	1/32	+ 5	– 5	25
LM258X	240 x 64	149 x 57 x 13 max.	117 x 41	0.44 x 0.44	1/64	+ 5	– 12	66
LM300XM	240 x 64	180 x 75 x 10.9 max.	132 x 39	0.48 x 0.48	1/32	+ 5	– 9	33
LM221XB	240 x 128	180 x 120 x 13.8 max.	148 x 75	0.50 x 0.50	1/64	+ 5	– 13.5	130
LM238XB	240 x 128	180 x 120 x 13.8 max.	148 x 75	0.50 x 0.50	1/64	+ 5	– 13.5	210
LM213XB	256 x 64	184 x 75 x 12 max.	149.6 x 43	0.51 x 0.51	1/64	+ 5	– 10.5	250
LM246X	320 x 256	168 x 150 x 13.5 max.	142 x 115	0.38 x 0.38	1/128	+ 5	– 20	76
LM211XB	480 x 64	270 x 82 x 13 max.	240 x 38	0.44 x 0.44	1/64	+ 5	– 10.5	130
LM215XB	480 x 128	270 x 110 x 11.5 max.	242 x 69	0.43 x 0.43	1/64	+ 5	– 13.5	100
LM236XB	640 x 200	270 x 149 x 13.5 max.	239 x 104	0.32 x 0.46	1/100	+ 5	– 14.5	170
LM280XM	640 x 200	270 x 104 x 13 max.	236.4 x 78	0.33 x 0.33	1/200	+ 5	– 20.5	180
LM254XP	640 x 200	270 x 150 x 16 max.	234 x 104	0.32 x 0.46	1/200	+ 5	– 21.5	190
LM755CXGP	640 x 400	270 x 198 x 13.5 max.	236 x 153.6	0.33 x 0.33	1/200	+ 5	– 21.5	250
LMG6010XUFR■■	640 x 480	285 x 217 x 7 max.	216 x 163	0.30 x 0.30	1/240	+ 5	+ 32	1,330*
LM268CXP	740 x 540	290 x 214 x 15.5 max.	241 x 174	0.28 x 0.28	1/270	+ 5	+ 32	650

EL Backlighted Versions

Part No.	No. of dot W x H (dot)	External dimensions W x H x T (mm)	Effective viewing area W x H (mm)	Dot size W x H (mm)	Driving method (Duty)	Recommended power supply VDD-VSS (V)	Recommended power supply VEE-VSS (V)	Power consumption (typ.) (mW)
LM300XN	240 x 64	180 x 75 x 10.9 max.	132 x 39	0.48 x 0.48	1/32	+ 5	– 9	33*
LM313XBN	256 x 64	184 x 75 x 12 max.	149.6 x 43	0.51 x 0.51	1/64	+ 5	– 10.5	250*
LM315XBN	480 x 128	270 x 110 x 11.5 max.	239.5 x 65.5	0.43 x 0.43	1/64	+ 5	– 13.5	100*
LM674XGNR	640 x 200	270 x 154 x 14.5 max.	243 x 114	0.34 x 0.49	1/100	+ 5	– 15.0	250*
LM254XNP	640 x 200	270 x 150 x 16 max.	234 x 104	0.32 x 0.46	1/200	+ 5	– 21.5	450*
LM272CXGNR	640 x 400	270 x 198 x 14 max.	236 x 153.6	0.33 x 0.33	1/200	+ 5	– 21.5	640*
LMG6011XUFE■■	640 x 480	285 x 217 x 7 max.	216 x 163	0.30 x 0.30	1/240	+ 5	+ 32	1,330*

CCFL Backlighted Versions

Part No.	No. of dot W x H (dot)	External dimensions W x H x T (mm)	Effective viewing area W x H (mm)	Dot size W x H (mm)	Driving method (Duty)	Recommended power supply VDD-VSS (V)	Recommended power supply VEE-VSS (V)	Power consumption (typ.) (mW)
LM384XF	640 x 200	289 x 150 x 30 max.	234 x 104	0.32 x 0.46	1/200	+ 5	– 21.5	500*
LM383XF	640 x 400	292 x 201 x 30 max.	236 x 153.6	0.33 x 0.33	1/200	+ 5	– 21.5	1,330*
LM383CXFR	640 x 400	292 x 201 x 30 max.	236 x 153.6	0.33 x 0.33	1/200	+ 5	– 21.5	730*
LM296DXBF■	640 x 400	292 x 198 x 21.0 max.	234 x 150	0.32 x 0.32	1/200	+ 5	– 24.0	454*
LM837DXF■	640 x 480	285 x 217 x 22.0 max.	216 x 163	0.30 x 0.30	1/240	+ 5	+ 32	1,330*
LMG9000ZZZ■	1120 x 780	316 x 230 x 31 max.	236 x 166	0.185 x 0.185	1/390	+ 5	+ 38.0	2,500*

Note: All part numbers listed above, unless otherwise noted, are Super Twisted Nematic (STN).

*Excluding the backlight
† Twisted Nematic (TN)
■Double Super Twisted Nematic (DSTN)
■■Film Super Twisted Nematic (Film STN)
(1) Consult factory for final specifications

(Specifications are subject to change without notice.)

Operating temperature (°C)	Storage temperature (°C)	Weight (g)	Color mode	Built-in driver	Controller		Part No.
					Built-in	Separate	
0 ~ + 50	– 20 ~ + 60	150	Y	HD44104	–	HD61830	LM200
0 ~ + 40	– 20 ~ + 60	120	Y	LC7940/41/42	–	HD61830	LM258X
0 ~ + 40	– 20 ~ + 60	170	Gray	LC7940/41/42	–	HD61830	LM300XM
0 ~ + 40	– 20 ~ + 60	210	Y	HD61100/03	–	HD61830	LM221XB
0 ~ + 40	– 20 ~ + 60	220	Y	HD61200/03	HD61830	– –	LM238XB
0 ~ + 40	– 20 ~ + 60	180	Y	MSM5839/5238	HD61830	– –	LM213XB
0 ~ + 40	– 20 ~ + 60	265	Y	HD61104/05	–	HD63645F/64645F	LM246X
0 ~ + 40	– 20 ~ + 60	180	Y	MSM5839/5238	–	HD61830	LM211XB
0 ~ + 40	– 20 ~ + 60	320	Y	HD61100/03	–	HD61830	LM215XB
0 ~ + 40	– 20 ~ + 60	450	Y	MSM5279/78	–	HD64646F/MSM6255	LM236XB
0 ~ + 40	– 20 ~ + 60	290	Gray	MSM5298/5299	–	HD64646F/MSM6255	LM280XM
0 ~ + 40	– 20 ~ + 60	480	Y	HD61104/05	–	HD63645F/64645F/66840	LM254XP
0 ~ + 40	– 20 ~ + 60	540	Y	HD61104/05	–	HD63645F/64645F/66840	LM755CXGP
0 ~ + 40	– 20 ~ + 50	585	B/W	HD61107	–	HD63645F/64645F/66840	LMG6010XUFR
0 ~ + 40	– 20 ~ + 60	900	Y	HD66106F	–	HD63645F/64645F/66840	LM268CXP

Operating temperature (°C)	Storage temperature (°C)	Weight (g)	Color mode	Built-in driver	Controller		Part No.
					Built-in	Separate	
0 ~ + 40	– 20 ~ + 60	160	Y	LC7940/41/42	–	HD61830	LM300XN
0 ~ + 40	– 20 ~ + 60	190	Y	MSM5839/5238	HD61830	—	LM313XBN
0 ~ + 40	– 20 ~ + 60	340	Y	HD61100/03	–	HD61830	LM315XBN
0 ~ + 40	– 20 ~ + 60	530	Blue	MSM5279/78	–	HD64646F/MSM6255	LM674XGNR
0 ~ + 40	–20 ~ + 60	500	Y	HD61104/05	–	HD63645F/64645F/66840	LM254XNP
0 ~ + 40	–20 ~ + 60	750	Blue	HD61104/05	–	HD63645F/64645F/66840	LM272CXGNR
0 ~ + 40	– 20 ~ + 50	600	B/W	HD61107	—	HD63645F/64645/66840	LMG6011XUFE

Operating temperature (°C)	Storage temperature (°C)	Weight (g)	Color mode	Built-in driver	Controller		Part No.
					Built-in	Separate	
0 ~ + 40	– 20 ~ + 50	1,100	Y	HD61104/05	–	HD63645F/64645F/66840	LM384XF
0 ~ + 40	– 20 ~ + 50	1,500	Y	HD61104/05	–	HD63645F/64645F/66840	LM383XF
10 ~ + 40	– 20 ~ + 50	1,500	Blue	HD61104/05	–	HD63645F/64645F/66840	LM383CXFR
10 ~ + 40	– 20 ~ + 50	1,200	B/W	HD61104/05	–	HD63645F/64645F/66840	LM296DXBF
10 ~ + 40	– 20 ~ + 50	1,250	B/W	HD61107	–	HD63645F/64645F/66840	LM837DXF
0 ~ + 40	– 20 ~ + 50	(1)	B/W	(1)	–	(1)	LMG9000ZZZ

Character and Segment LCD Modules

Character LCD Modules

Hitachi character LCD modules are ideal for general-purpose character displays where numbers, letters, and symbols are presented. These products display 160 types of 5 x 7 dot character fonts, and 32 types of 5 x 10 dot character fonts.

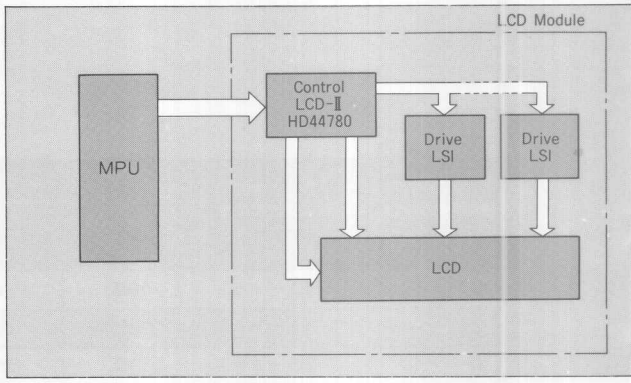
Hitachi's broad line includes LCD modules ranging from 1 to 4 lines in length, up to a maximum of 40 characters. A wide selection of EL backlighted versions provides clear, highly legible images. See page 18 for options available.

Versions with LED backlight are available, and all models include built-in drivers and controllers. Built-in instruction functions include: display clear, cursor home, display on/off, cursor on/off, character display blink, cursor shift, and display shift.

Applications

- Telephones
- Facsimile Machines
- Electronic Typewriters
- POS Terminals
- Test and Measurement Equipment

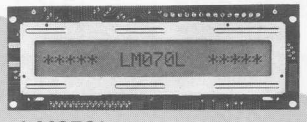
Character LCD Module System



1 line series

●LM054

●H2570



●LM070L

●LM015

●LM020L

●LM027

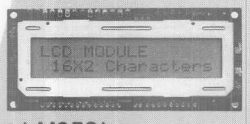
●H2571

●LM568F

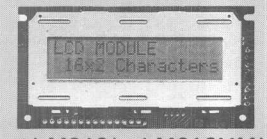
●LM038

●H2572

2 line series

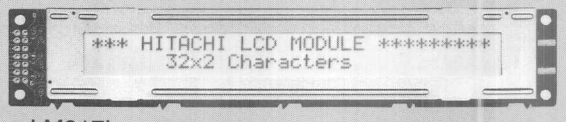


● LM052L



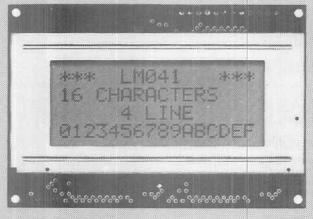
●LM016L, LM016XML

●LM032L, LM032XML

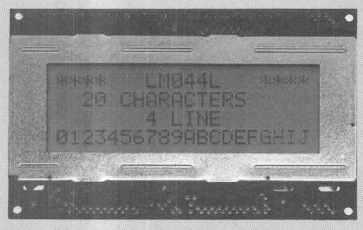


● LM017L

4 line series



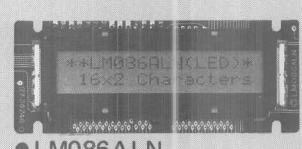
● LM041L



● LM044L

LED Backlighted Versions

● LM087LN



● LM086ALN

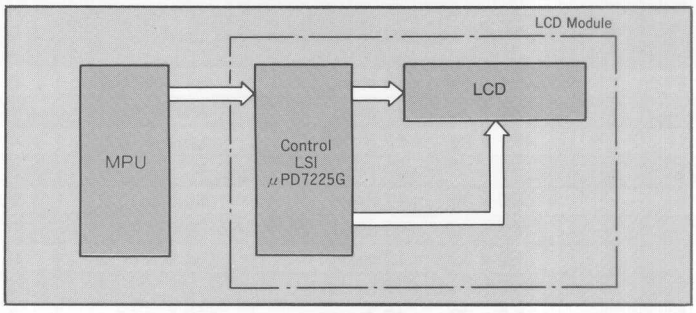
Segment Display LCD Modules

Segment display LCD modules are well-suited for cost-effective 7-segment display applications. These products feature a built-in controller and driver, and operate from a single 5 volt power supply.

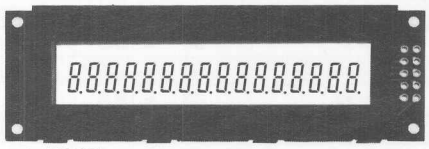
Applications

- Telephones
- Counters
- Timers

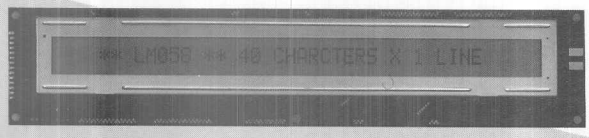
Segment Display LCD Module System



Segment Display LCD Module



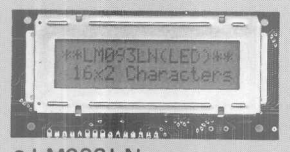
● LM039



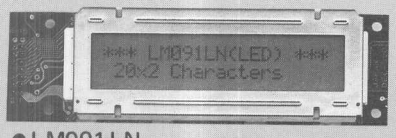
● LM058

● LM018L

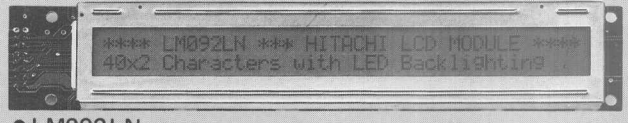
● LM107XML



● LM093LN



● LM091LN



● LM092LN

Character and Segment LCD Modules

Character LCD Modules (without backlight)

Part No.	No. of char. (Char. x line)	External dimensions W x H x T (mm)	Effective viewing area W x H (mm)	Character dimensions W x H (mm)	Driving method (Duty)	Recommended power supply V_{DD}-V_{SS} (V)
LM054	8 x 1	84 x 44 x 12 max.	61 x 15.8	6.45 x 9.4	1/8	+ 5
LM015	16 x 1	80 x 36 x 12 max.	64.5 x 13.8	3.15 x 5.5	1/8	+ 5
LM568F	16 x 1	122 x 33 x 12 max.	99.0 x 13.0	4.84 x 8.06	1/8	+ 5
H2570	16 x 1	80 x 36 x 12 max.	64.5 x 13.8	3.15 x 7.9	1/11	+ 5
LM020L[2]	16 x 1	80 x 36 x 12 max.	64.5 x 13.8	3.07 x 5.73	1/16	+ 5
LM070L	20 x 1	105 x 39 x 11 max.	84.0 x 13.0	3.2 x 5.2	1/8	+ 5
LM038	20 x 1	182 x 35.5 x 13 max.	154.0 x 15.3	6.7 x 9.4	1/8	+ 5
LM027	24 x 1	126 x 36 x 12 max.	100 x 13.8	3.15 x 7.9	1/11	+ 5
H2571	32 x 1	174.5 x 33 x 13.4 max.	132.5 x 14	3.15 x 7.9	1/11	+ 5
H2572	40 x 1	182 x 35.5 x 13 max.	154.0 x 15.3	3.15 x 7.9	1/11	+ 5
LM058	40 x 1	290 x 60 x 13 max.	245 x 19	4.82 x 9.36	1/8	+ 5
LM052L[2]	16 x 2	80 x 36 x 11 max.	64.5 x 13.8	2.95 x 3.8	1/16	+ 5
LM016L[2]	16 x 2	84 x 44 x 12 max.	61 x 15.8	2.96 x 4.86	1/16	+ 5
LM016XML[1]	16 x 2	84 x 44 x 12 max.	61 x 15.8	2.96 x 4.86	1/16	+ 5
LM032L[2]	20 x 2	116 x 39 x 13 max.	83 x 18.6	3.2 x 4.85	1/16	+ 5
LM032XML[1]	20 x 2	116 x 37 x 10.5 max.	83 x 18.6	3.2 x 4.85	1/16	+ 5
LM060L	24 x 2	116 x 39 x 13 max.	83 x 18.6	2.7 x 4.85	1/16	+ 5
LM017L	32 x 2	174.5 x 33 x 13.4 max.	141.19 x 16.75	3.45 x 4.85	1/16	+ 5
LM107XML[1]	40 x 2	170 x 30 x 11 max.	150.1 x 15.1	3.2 x 4.85	1/16	+ 5
LM018L[2]	40 x 2	182 x 35.5 x 13 max.	154 x 15.3	3.2 x 4.85	1/16	+ 5
LM041L	16 x 4	87 x 60 x 12 max.	61.8 x 25.2	2.95 x 4.15	1/16	+ 5
LM044L	20 x 4	98 x 60 x 12 max.	76 x 25.2	2.95 x 4.15	1/16	+ 5

[1] Yellow mode, Super Twisted Nematic (STN).
[2] EL backlight versions available. See page 18.

Character LCD Modules (with LED backlight)

Part No.	No. of char. (Char. x line)	External dimensions W x H x T (mm)	Effective viewing area W x H (mm)	Character dimensions W x H (mm)	Driving method (Duty)	Recommended power supply V_{DD}-V_{SS} (V)*
LM087LN	16 x 1	90 x 36 x 14 max.	64.5 x 13.8	3.07 x 6.56	1/16	+ 5, (+ 5)
LM086ALN	16 x 2	90 x 36 x 14 max.	64.5 x 13.8	2.95 x 3.8	1/16	+ 5, (–)
LM093LN	16 x 2	90 x 44 x 13.8 max.	61.0 x 15.3	2.96 x 4.86	1/16	+ 5, (+ 5)
LM091LN	20 x 2	126 x 39 x 14 max.	83 x 18.6	3.2 x 4.85	1/16	+ 5, (+ 5)
LM092LN	40 x 2	192 x 35.5 x 14 max.	154 x 15.3	3.2 x 4.85	1/16	+ 5, (+ 5)

*(V_{LED})

Segment Display LCD Modules

Part No.	No. of char. (Char. x line)	External dimensions W x H x T (mm)	Effective viewing area W x H (mm)	Character dimensions W x H (mm)	Driving method (Duty)	Recommended power supply V_{DD}-V_{SS} (V)
LM039	16 x 1	87 x 27.5 x 11 max.	64.7 x 13.3	2.2 x 6.4	1/4	+ 5

Note: All part numbers listed above, unless otherwise noted, are Twisted Nematic (TN).

(Specifications are subject to change without notice.)

Power consumption (typ.) (mW)	Operating temperature (°C)	Storage temperature (°C)	Weight (g)	Built-in LSI controller and driver	Part No.
10	0 ~ + 50	– 20 ~ + 70	35	HD44780	LM054
10	0 ~ + 50	– 20 ~ + 70	25	HD44780	LM015
10	0 ~ + 50	– 20 ~ + 70	50	HD44780	LM568F
10	0 ~ + 50	– 20 ~ + 70	25	HD44780	H2570
10	0 ~ + 50	– 20 ~ + 70	25	HD44780	LM020L
10	0 ~ + 50	– 20 ~ + 70	40	HD44780	LM070L
25	0 ~ + 50	– 20 ~ + 70	65	HD44780	LM038
10	0 ~ + 50	– 20 ~ + 70	40	HD44780	LM027
10	0 ~ + 50	– 20 ~ + 70	60	HD44780	H2571
10	0 ~ + 50	– 20 ~ + 70	65	HD44780	H2572
15	0 ~ + 50	– 20 ~ + 70	150	HD44780	LM058
15	0 ~ + 50	– 20 ~ + 70	25	HD44780	LM052L
15	0 ~ + 50	– 20 ~ + 70	35	HD44780	LM016L
15	0 ~ + 40	– 20 ~ + 60	35	HD44780	LM016XML
15	0 ~ + 50	– 20 ~ + 70	50	HD44780	LM032L
15	0 ~ + 40	– 20 ~ + 60	50	HD44780	LM032XML
15	0 ~ + 50	– 20 ~ + 70	60	HD44780	LM060L
15	0 ~ + 50	– 20 ~ + 70	60	HD44780	LM017L
15	0 ~ + 40	– 20 ~ + 60	50	HD44780	LM107XML
15	0 ~ + 50	– 20 ~ + 70	65	HD44780	LM018L
15	0 ~ + 50	– 20 ~ + 70	60	HD44780	LM041L
17.5	0 ~ + 50	– 20 ~ + 70	65	HD44780	LM044L

Power consumption (typ.) (mW)	Operating temperature (°C)	Storage temperature (°C)	Weight (g)	Built-in LSI controller and driver	Part No.
155	0 ~ + 50	– 20 ~ + 70	40	HD44780	LM087LN
150	0 ~ + 50	– 20 ~ + 70	40	HD44780	LM086ALN
405	0 ~ + 50	– 20 ~ + 70	50	HD44780	LM093LN
555	0 ~ + 50	– 20 ~ + 70	70	HD44780	LM091LN
855	0 ~ + 50	– 20 ~ + 70	100	HD44780	LM092LN

Power consumption (typ.) (mW)	Operating temperature (°C)	Storage temperature (°C)	Weight (g)	Built-in LSI controller and driver	Part No.
1.05	0 ~ + 50	– 20 ~ + 70	20	μPD7225G	LM039

Segment LCD Devices for Test and Measurement Equipment

Hitachi expertise in LCD design and manufacturing makes possible a line of segment displays capable of operating under severe temperature environments. These devices, intended for test and measurement applications, feature outstanding reliability and quality, and are available in both Standard (− 10° ~ + 60°C operating) and Extended (− 20° ~ + 80°C operating) Temperature versions.

Models are available with 3⅓ to 10 digits; many have extra symbols or characters. All Hitachi Extended Temperature Segment LCDs feature fast response, and include connector pins for easy mounting and integration into your system.

Applications

- Meters
- Test and Measurement Equipment
- Medical Equipment
- Thermometers
- Automotive Instruments

Superior Performance of Hitachi LCDs in Extended Temperature Environments

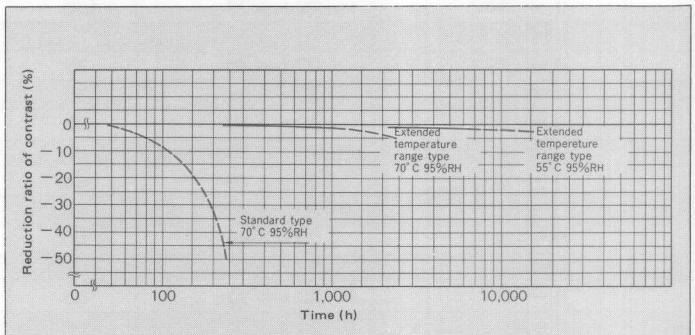


Fig1. High temperature and humidity test

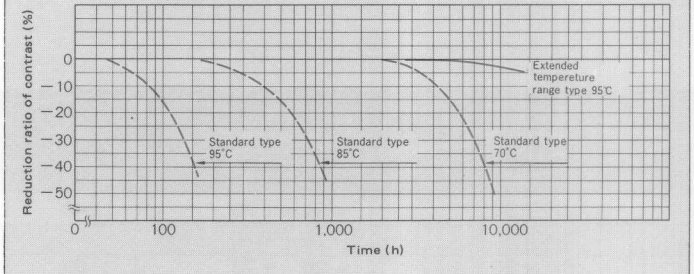
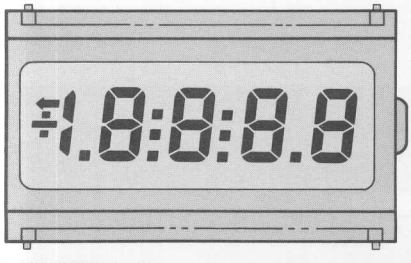
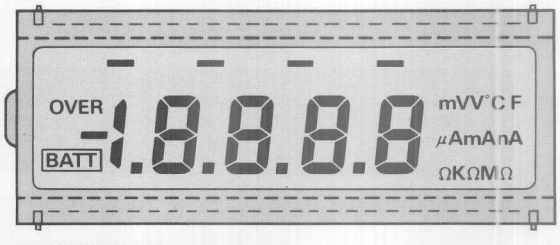


Fig2. High temperature test



● H1332CH-C



● LS060CH-C

Common Specifications

Item		Standard type	Extended temperature range type	Unit
Operating temperature		–10 ~ +60	–20 ~ +80	°C
Storage temperature		–20 ~ +60	–30 ~ +85	°C
Driving method		Static	Static	–
Driving voltage		5	5	V
Driving frequency		32	64	Hz
Response time	Rise time at 25°C	50	50	ms
	Fall time at 25°C	110	50	ms
Terminal width		1.52	1.52	mm
Terminal pitch		2.54	2.54	mm
Recommended LSI		HD44790 · HD44100 · HMCS45C HMCS43C · IMC7224 · ICL7116 CD4055B · HD14543B · HD61602 HD61603 · HD613900		

Part No.		External dimensions W x H (mm)	Connector pins		Display description		
Standard type	Extended temperature range type		Number	Length (mm)	Digits	Character height (mm)	Symbol
LS021C-C	LS021CH-C	51.5 x 22	40	6.35	3-1/3	8.9	← ÷
LS021CB-C	LS021CA-C			9.0			
LS022C-C	LS022CH-C		40	6.35	4	8.9	None
LS023C-C	LS023CH-C		40	6.35	4-1/3	7.6	← ÷
LS007C-C	LS007CH-C	50.8 x 30.5	40	6.35	3-1/3	12.7	LO BAT ÷
LS007CB-C	—			9.0			
HI331C-C	HI331CH-C		40	6.35	3-1/3	12.7	← ÷
—	HI331CA-C			9.0			
HI332C-C	HI332CH-C		40	6.35	4-1/3	10.2	← ÷
HI333C-C	HI333CH-C		40	6.35	4	12.7	None
—	HI333CA-C			9.0			
LS024C-C	LS024CH-C		40	6.35	5	10.2	None
LS024CB-C	—			9.0			
HI335C-C	HI335CH-C	70 x 30	50	6.35	6	12.7	None
HI335CB-C	—			9.0			
LS060C-C	LS060CH-C		54	6.35	4-1/3	13.6	Various
LS066C-C	LS066CH-C	70 x 38.1	40	6.35	3-1/3	17.8	LO BAT ÷
HI336C-C	HI336CH-C		40	6.35	3-1/3	17.8	← ÷
HI337C-C	HI337CH-C		40	6.35	4	17.8	None
HI337CB-C	—			9.0			
LS025C-C	LS025CH-C		40	6.35	4-1/3	15.2	← ÷
LS026C-C	LS026CH-C	93.85 x 30.5	68	6.35	8	12.7	None
LS026CB-C	—			9.0			
LS027C-C	LS027CH-C	93.85 x 38.1	50	6.35	6	17.8	None
HI338C-C	HI338CH-C	93.85 x 45.72	40	6.35	3-1/3	25.4	← ÷
LS028C-C	LS028CH-C		40	6.35	4	25.4	None
HI339C-C	HI339CH-C		40	6.35	4-1/3	20.3	← ÷
LS029C-C	LS029CH-C	130 x 30	84	6.35	10	12.0	← ÷

(Specifications are subject to change without notice.)

Semi-custom LCD Modules

How to Specify Packaging, Backlighting and Transmission Options

Hitachi provides LCD modules with various options to let you custom-configure a product to match the requirements of your application precisely.

To define the correct part number, simply add a suffix to the basic part number. For example, an LM016L display with black bezel is specified using part number LM016AL. The LM200 display with transflective and wide temperature options is specified using part number LM200HT. When specifying an extended temperature range option for any part number ending in "L," drop the "L" and add "H." For example, LM016L becomes LM016H.

Types of Optional Specifications

A: Black-coated metal frame

T: Transflective type for installation of the EL backlight

H: Available in extended temperature range (operating: $-10°C \sim +70°C$; storage: $-20°C \sim +80°C$), driven by double power supply (Super Twisted Modules, Numbers 2–26, are not available in Extended Temperature versions.)

L: Duty = 1/16, available with single power supply of +5V

How to Read the Chart

O: Under production

X: Not available

–: Custom parts, special order

No.	Part No.	No. of display W x H	Optional specifications					Remarks
			A	T	H	LT	HT	
1	LM200	240 x 64 (dots)	—	O	O	X	O	Note 3
2	LM258X	240 x 64	—	—	X	X	X	
3	LM221XB	240 x 128	—	—	X	X	X	
4	LM238XB	240 x 128	—	—	X	X	X	
5	LM213B	256 x 64	—	X	X	X	X	
6	LM213XB	256 x 64	—	X	X	X	X	
7	LM246X	230 x 256	—	—	X	X	X	
8	LM211B	480 x 64	—	—	X	X	X	
9	LM211XB	480 x 64	—	—	X	X	X	
10	LM215B	480 x 128	—	—	X	X	X	Note 1
11	LM215XB	480 x 128	—	—	X	X	X	Note 1
12	LM224XB	480 x 128	—	—	X	X	X	Note 1
13	LM212	640 x 48	—	—	X	X	X	Note 1
14	LM266XW	640 x 100	—	X	X	X	X	Note 1
15	LM225X	640 x 200	—	—	X	X	X	Note 1
16	LM236XB	640 x 200	—	—	X	X	X	Note 1
17	LM585X	640 x 200	—	—	X	X	X	Note 1
18	LM280XM	640 x 200	—	—	X	X	X	Note 1
19	LM254XP	640 x 200	—	—	X	X	X	Note 1
20	LM252X	640 x 400	—	—	X	X	X	Note 1
21	LM755CXGP	640 x 400	—	—	X	X	X	
22	LM268CXP	740 x 540	—	—	X	X	X	
23	LM254XNP	640 x 200	—	—	X	X	X	
24	LM272CXGNR	640 x 400	—	—	X	X	X	
25	LM384XF	640 x 200	—	—	X	X	X	
26	LM383XF	640 x 400	—	—	X	X	X	
27	LM054	8 x 1 (lines)	—	O	O	X	—	Note 3
28	LM015	16 x 1	—	O	—	X	—	
29	LM568F	16 x 1	O	—	—	X	—	Note 3
30	H2570	16 x 1	—	O	O	X	O	
31	LM067	16 x 1	—	—	X	—	X	
32	LM020L	16 x 1	—	—	—	—	—	Note 3
33	LM087LN	16 x 1	—	X	X	X	X	
34	LM070L	20 x 1	—	—	—	—	—	
35	LM038	20 x 1	—	O	O	X	O	
36	LM027	24 x 1	—	O	—	X	—	
37	H2571	32 x 1	—	O	O	X	O	Note 3
38	H2572	40 x 1	O	O	O	X	—	
39	LM104L	16 x 2	—	—	—	—	—	
40	LM052L	16 x 2	—	—	—	—	—	Note 3
41	LM068L	16 x 2	—	—	X	—	X	
42	LM016L	16 x 2	O	O	O	O	O	Note 3
43	LM086ALN	16 x 2	O	X	X	X	X	
44	LM093LN	16 x 2	—	X	X	X	X	
45	LM032L	20 x 2	—	O	O	O	—	Note 2
46	LM105L	20 x 2	—	—	—	—	—	
47	LM091LN	20 x 2	—	X	X	X	X	
48	LM060L	24 x 2	—	—	—	—	—	
49	LM017L	32 x 2	—	O	O	O	O	
50	LM107L	40 x 2	—	—	—	—	—	
51	LM018L	40 x 2	—	O	O	O	O	Note 3
52	LM092LN	40 x 2	—	X	X	X	X	
53	LM041L	16 x 4	—	—	O	O	X	Note 2
54	LM044L	20 x 4	—	—	—	O	X	Note 2, Note 3

Note 1. When the EL panel is installed, specifications are subject to change.

2. Since these LCD modules do not have a pad for soldering the terminals for the EL backlight, it is necessary for the customer to solder on the motherboard. Consult your sales office for further details.

3. 12 o'clock viewing option available.